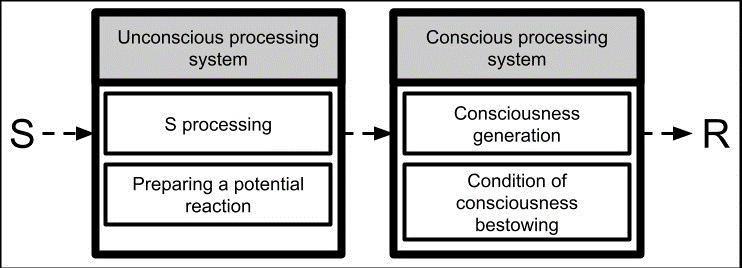
**Chapter (7):** **A theoretical outline for explanatory consciousness (TOEC): how an unconscious mental-state changes into consciousness and vice versa**

The current chapter is based on previous chapters and especially chapter 6. The chapter is divided into two parts. In the first part, I outline a theory of CΨ based on two fundamental processes. Every stimulus, whether received from the external environment or whether it comes from the inner environment, undergoes non-conscious information processing. Some of the results of this unconscious processing may proceed to CΨ. In the second part, I outline two important mechanisms that transform an unconscious mental-state (M) into a conscious one.

**PART (I): A theoretical outline of explanatory consciousness (TOEC): A proposal for unconscious followed by conscious processes**



**Figure 7.1** depicts the flow of information from the stimulus (S) through the unconscious processing system via the conscious processing system, which produce the response (R).

Figure 7.1 describes the theoretical outline of explanatory consciousness (TOEC) by a simple functional diagram of boxes and arrows. It outlines the stages of the information processing of a stimulus received by the individual (for example, by the visual system). In the initial stage, unconscious mechanisms process the information. Then the unconscious processed end-result is transferred to conscious processes that produce the proper response. (Note that for the sake of simplicity, this diagram does not describe all the mechanisms and interactions involved in processing the stimuli. Rather it highlights a number of processes that are important for the chapter.) The purpose of Figure 7.1 is to highlight two important features that emerge from the discussion so far (see chapter 6).

First, research indicates that a stimulus received by the sensory system undergoes multi-stage unconscious information processing. For example, Davies (2008, P. 1) writes: “It is a central idea in cognitive science that there can be unconscious information processing. It is also plausible that there can be unconscious thought and unconscious emotions; ….” And Libet (1982) proposed on a basis of neurophysiological research in the brain that about half a second of an unconscious appropriate neural processing is needed for reaching CΨ (for review, see Blackmore 2013). Since the Figure 7.1 depicts the flow of information from left to right, the system that handles non-conscious processing appeared on the left side of the diagram. On the right, appears the system that handles conscious information processing (the end-result of non-conscious processing).

Secondly, each system includes two important mechanisms. The non-conscious information processing system includes the mechanism for processing the stimulus, which has been received by the sensory (visual) system; and a mechanism of preparedness, of alertness, the unconscious mechanism that prepares a potential response. The specific response has not yet been determined (except for cases with reflexive and instinctive responses), since it depends on the conscious decision of the individual (in an experiment, for example, it is based on the instructions given to the participant). The alerting state created in the brain is analogous to the alerting state of a military patrol squad during wartime. The soldiers do not know if they will be attacked, from where and when the attack will occur. All they can do is keep a high alert.

The conscious information processing system includes two important mechanisms related to the endowment of CΨ on mental-states, which will be described below. (This theoretical idea is based on Rakover, in press.) The first mechanism fulfills two fundamental functions: it creates CΨ and induces it on mental-states. The second mechanism is a condition that determines on which mental-state CΨ will be induced. Without this condition, the individual's mind may be flooded with conscious information – a situation that will harm his ability for survival. Consciousness is conceived here metaphorically as a energy-field, analogues to an electromagnetic field.

Given the TOEC, I will discuss here the following two topics. First, the section of “unconsciousCΨ and CΨ” deals with the explanatory relations between unconscious and conscious processing. Finally, the “Consciousness and explanation” section handles the question whether CΨ can be viewed as an explanatory concept.

*UnCΨ and CΨ*

How does TOEC cope with the non-conscious information processing? As an answer, I will concentrate on Libet’s (1985) famous experiments, which are most relevant to examine the issue of non-conscious information processing. This discussion will support the principle of “unconscious processing first”. Accordingly, every stimulus, which is received by the individual’s sensory system, undergoes unconscious information processing first, and only then the processed stimulus, i.e., the end-result of the information processing, may enter the state of CΨ.

Libet (1985) measured in human participants three important events related to the voluntary action of wrist flexion. (1) Action (A): the time of occurrence of a spontaneous voluntary wrist flexion. (2) Will (W): the time when the participant in the experiment felt a spontaneous will to flex the wrist. (3) Readiness Potential (RP): the time when RP is measured by Electroencephalography (EEG). Previous research showed that a voluntary action is preceded by RP – a specific neurophysiological activity in the brain. Libet has discovered the following sequence of events: RP came first and after about 350 msec appeared W, a conscious state which was followed by A after about 200 msec. He interpreted this discovery as follows: “This leads to the conclusion that cerebral initiation even of a spontaneous voluntary act of the hand studied here can and usually does begin *unconsciously.* … Put another way, the brain ‘decides’ to initiate or, at least, to prepare to initiate the act before there is any reportable subjective awareness that such a decision has taken place” (Libet, 1985, p. 536). Therefore, it seems that unconscious process and not our conscious one determines our actions. If this interpretation is correct, then why do one need consciousness? What is it good for? These questions bothered scientists and philosophers for decades (e.g., Brass, Furstenberg and Mele 2019: Velmans 1991). For example, Velmans (1991) suggested that CΨ plays a minor role in the explanation of behavior. However, Rakover (1996) argues that although initially a stimulus is processed unconsciously, later it may enter CΨ and become effectual. From Velmans' (1996) answer to Rakover's (1996) criticism, it appears that while both researchers agree that the processing of the stimulus is done first in a non-conscious manner, the disagreement revolves around the question of what the functions of CΨ are. While Velmans believes that from the third-person perspective CΨ has no effect on information processing, Rakover (1996) assumes that CΨ has important effects on human behavior including information processing.

There are a number of researchers, who believe that CΨ has an effect on behavior. For example, Libet (1985) himself proposed that the individual can stop, veto the execution of the action during the short time between W and A (Brass et al. 2019, reviewed several studies that can be interpreted as supporting Libet's veto idea). Hare et al. (2009) suggested that self-control is related to a brain neurophysiological system that is different from the one related to goal planning. In comparison, as I proposed previously, CΨ has a huge influence on behavior. The basic idea is that every stimulus, whether it is external or internal, first undergoes a very fast and non-conscious information processing. Also in the present case, the internal stimulus related to W undergoes non-conscious information processing. The results of this processing proceeds to the state of CΨ. This description in no way detracts from the importance of the conscious mental-state (M) in explaining human behavior. First, CΨ is a crucial condition for the feeling of being-alive. It has the most important role in life – being-alive, the aliveness-feel. If one loses CΨ, then his/her life is similar to a plant. And if CΨ is regained, the aliveness-feel is recovered.

Second, CΨ has important role for one’s survival. The CΨ initiates, stops and monitors behavior in accordance to the way the individual perceives its ownself in relation to the surroundings. For example, a gazelle's behavior will change dramatically when it notices that a lioness is lurking in the thicket of the bushes to hunt for prey. And David's behavior will change completely if he finds out that the woman he fell head over heels in love with enters the party he is at.

Given the TOEC approach, one may comprehend Libet’s (1985) experimental results in the following way. Libet's experiment can be seen as examining the relationship between the first and second stages of information processing as sketched by the TOEC. In the first stage a non-conscious processes handle the stimulus and evokes the reactive system to a level of preparedness and alertness for any potential response whose choice will be determined by a conscious process in the second stage.

*Consciousness and explanation*

Is CΨ necessary for offering a satisfactory explanation for behavior? In other words, is it possible to understand behavior without using CΨ as an explanatory factor?

A number of researchers have developed an approach that I shall call "consciousness-unnecessity", which proposes that CΨ has a minor importance for the explanation of behavior (e.g. Bargh & Morsella, 2008; Dawkins, 1995;Dijksterhuis & Aarts, 2010; Flanagan, 1992; Nisbett & Wilson, 1977; Velmans, 1991; Wenger, 2003). By contrast, other researchers have developed an approach that I shall call "consciousness-necessity", which proposes that CΨ is important for behavior explanation (e.g., Baars, 2002; Baumeister, 2008; Funder, 2009; Rakover, 1996, 2011/2012a,b; Weidemann, Satkunarajah & Lovibond, 2016). Here are two examples of the consciousness-unnecessity approach. Dawkins (1995)wrote: "There is no prediction we can make that if the animal has consciousness it should do X but not conscious it should do Y" (p. 139). And Flanagan (1992)conceived of "conscious inessentialism" as "the view that for any activity i performed in any cognitive domain d, even if we do i consciously, i can in principle be done non-consciously" (p. 129).

I cannot accept the consciousness-unnecessity approach. One crucial reason is the simple fact that without CΨ a person cannot stand on his own feet. This approach seems to be based on the "multi-functions argument”. Given that many mathematical functions can be fitted to any set of empirical observations, and given that these functions express different mechanistic theories (which do not use mental concepts such as will and belief) it follows that a mechanistic theory may be constructed for any set of psychological observations, behavior. Thus, one does not need to use the concept of CΨ, which is complicated, undefined and cannot be measured, to understand behavior satisfactorily.

The multi-functions argument is based on a crucial hidden fact, which many researchers have overlooked: the behavior that is explained in psychology is stripped of CΨ. The psychological indexes (such as number of correct responses and reaction time) do not carry any subjective conscious meaning, and in fact they are equal to a robot's behavior. These indexes are based on public responses, on certain behavioral movements, e.g., pressing a specific key. Psychologists treat only those behavioral properties that belong to the public domain. For example, one presses the right key for correct response and the left key for incorrect, and the experimenter calculates the percent correct (number of right presses/all presses) over the participants in the experiment. (Note1). So if the behavior to be explained is devoid of any subjective conscious meaning, no wonder that the explanation is constructed mechanistically. However, in this case one does not account for an individual conscious meaningful behavior but suggests an explanation for a zombie's behavior. Thus, one may propose that a computer cannot imitate one’s (Smith’s) behavior exactly since it cannot simulate Smith's meaningful behavior, the behavior interwoven with CΨ, but only the public behavior, i.e., the behavior stripped of CΨ.

To illustrate the above point that a computer cannot simulate behavior completely, consider the following “story-like experiment”: “Simulating Prof. Smith”. Scientists built a computer, Smith-II, which accurately imitates the scientific innovations of Prof. Smith. The reason for this is as follows: Prof. Smith was a great scientist with revolutionary original innovations, but he had a terminal illness. Thus, these scientists decided to build Smith-II to imitate Prof. Smith precisely so that Prof. Smith’s innovative ideas will not end with his death. Given this, the fundamental question was this: Will Smith-II be able to imitate Prof. Smith's originality. If the answer is yes, then it turned out that Smith-II is not original. Why? Because Smith-II is capable only to imitate what Prof. Smith has already done, i.e., it is only capable of imitating what has already been done and known. Therefore, another question was raised: Can Smith-II create something really original. The answer is that Smith-II is incapable of doing anything original on its own, because it was programmed to imitate precisely Prof. Smith's innovations. The last sentence requires clarification. It is clear that there are complex and advanced programs that may discover a solution to a problem that humans have wrestled with for a long time without a way out. However, this is not the current case. Why? Because here everything that the Smith-II knows is exactly what Prof. Smith knows. That is, the computer was provide with all the professor's scientific publications (but not, for example, with the way Prof. Smith played poker). Therefore, it is hard to propose that under this condition Smith-II will succeed in creating a new revolutionary scientific discovery, which Prof. Smith might have discovered had he not died.

**PART (II): A theoretical outline of explanatory consciousness (TOEC): The Induced-Consciousness Theory (ICT)**

The conclusion that emerges from the discussion in the previous chapters is this: the researches have not yet succeeded in developing a theory of CΨ that is accepted by the scientific community. In light of this, the following question has been raised: What cognitive–mental processes are necessary not for describing and explaining the mechanism that produce CΨ, but rather for the “alternating-states problem”. Accordingly, the problem is: how an unconscious mental-state (M) is transformed into a conscious one and vice versa (This is the minimal question according to Van Gulick, 1995.) In order to answer this question, one has to assume that the following four subsystems (each contains certain processes) are necessary (the discussion will focus mainly on visual information):

(a) *visual–perceptual subsystem* is the process that performs the function of processing visual stimuli.

(b) *consciousness–generation* is the process that creates CΨ and induces it on different Ms and processes.

(c) *enabling–consciousness condition* is the condition that triggers process (b) to induce CΨ automatically on certain Ms or processes when this condition has been fulfilled. The (c) condition determines when (b) is operated. Without it, the individual’s mind would probably be flooded with ceaseless random conscious Ms and processes.

(d) *observation–manipulation* (OM) are the processes that produce self-consciousness, introspection, memory and also deals with one’s own inner conscious ability to manipulate one’s Ms and processes. However, as it is possibly to see, OM processes are extremely complicated, so I can only offer a brief sketch of them within the proposed theoretical framework (e.g., Kriegel, 2023; Schwitzgebel, 2019).

Based on the discussions in previous chapters (especially chapter 1 and 6), I refer to CΨ in the following way. It is the unique subjective experience of a person, who perceives a stimulus in the external world or in her internal world. This is consistent with Nagel’s (1974) famous “What is it like?” approach and other views such as that of Gennaro (2012), who has followed Nagel. Similarly, Chalmers (1996) proposed the distinction between the hard and the easy problems. Accordingly, the hard problem of consciousness asks how humans have [phenomenal](https://en.wikipedia.org/wiki/Consciousness#Types_of_consciousness) experiences in the sense of Nagel’s conception of consciousness–a problem that defies any explanation. This is in contrast to the easy problems relating to such behaviors as discrimination or integration of information, which can be explained by specifying the processes that execute them.

In addition to this, I wish to re-emphasize the following two qualities related to consciousness. First, so far no objective way has been found to measure consciousness in a way similar to the measurements of motor responses. Second, CΨ is not related specifically to any particular perceived object or response. Consciousness is a state in which the individual is aware of what is happening around him and his external and internal reactions. Third, I adopt the *metaphor* of consciousness as similar to an electromagnetic field (e.g., Jones and Hunt, 2023; Van Gulick, 2022, subsection 2.3. Note, however, that I am not accepting any electromagnetic theory as a successful explanation of consciousness, e.g., Uttal, 2005).

The proposed induced-consciousness theory (ICT) is based on the above four subsystems. It attempts to provide an answer to one of the most important problems debated in the literature, the alternating-states problem: How is an unconscious-M changed into a conscious-M and vice versa? (e.g., Gennaro, 2012; Lycan, 2004; Rosenthal, 2004, 2005; Tye, 1995; Van Gulick, 1995; Wu & Morales, 2024)

The ICT, which is stemmed from the initial outline of Rakover (2019), requires two preliminary important comments to clarify the background of developing the present theory:

*Conceptualizations.* Marr (1982) famously put forward a three-level analytical framework. ICT has not been developed on either the implementation (neurophysiological) level or the algorithmic level, but rather on the functional (computational) level. On this level, the theory is characterized in terms of its goals; how it operates (e.g., the stages of information processing), and the rationale on which it is based.

ICT is part of the cognitive approach and its four subsystems can be conceived of as being anchored to hereditary processes that have developed in an evolutionary way and have matured as a result of the normal development of the individual. They can be characterized as functioning in a very fast and automatic manner, and most of their operations (except for their output, which may enter conscious states) are unconscious.

For the purposes of the present paper, a mental-state (M) is understood in the following terms. A system T represents an observational system O, when T’s symbols and their relations map certain aspects of O and their relation. In view of this, an M can represent either an individual’s external world or inner private world. For example, a cat can be represented in one’s cognitive system by hypothetical internal symbols [signified by e.g., M(cat)], which can be lingual or pictorial. This representation mediates between the external world (the stimulus) and the individual’s response.

*Evaluation.* Given the above explication of ICT’s development, the following question arises: how can this theoretical delineation be evaluated? Because ICT is formulated mainly at the theoretical level of information processing, I propose that the main ways to evaluate this delineation are:

1. By examining its ability to explain successfully empirical phenomena,

especially everyday behavior;

(2) By its ability to solve successfully and in an easy and simple way problems that other theories of consciousness have difficulties in handling. I decided to compare ICT with the well-known representational theory, the higher-order thought (HOT) theory of consciousness, for the following reason. Of all the theories that try to explain the alternating-states problem: how an unconscious-M becomes a conscious-M and vice versa, much of the discussion in the academic literature has centered on HOT theory (e.g., Brown et al., 2019; Carruthers and Gennaro, 2020; Gennaro, 2012, 2023b; Rosenthal, 2004, 2005).

*Introducing the ICT by its application*

To introduce the ICT and its subsystems, I will examine a simple episode from everyday life, an *ordinary evening* in the life of a normal person, Mr. Smith. He sits down on the couch to watch television, holding the remote control in his hand. The large TV screen hangs on the white wall facing him. To the right of the screen a luxuriant plant with rich green leaves stands in a flowerpot. Above the screen hang two pictures: prints of self-portraits by Vincent van Gogh after he cut off his ear and Rembrandt van Rijn in his twilight years. Smith consciously grasps all these details (the five items: the wall, TV, flowerpot, and two pictures) at once. He even perceives the floor of the room and the fact that he is holding the TV remote control in his hand, but his conscious perception of these is not as sharp as his perception of what is in front of him; it is, rather, a weak conscious perception. He activates the remote control and gives his full attention to the action movie playing on the screen facing him. (On the complicated relationships between attention and consciousness, see Gennaro, 2017.)All the other details around him disappear from his awareness–he no longer perceives them.

The immediate question that arises here is: How can these changes in Smith’s perceptual awareness be explained? The answer is as follows.

The five visual items of the *ordinary evening* have undergone a very fast and unconscious (parallel) elaboration by the visual-perceptual processing. The results of this process are represented appropriately in five different mental-states (Mi where i signifies different M), which reflect the objective properties of the visual stimuli, and the connections between them (e.g., size, color, and spatial relationships).

The process of consciousness-generation confers consciousness on each of the five mental-states. It is assumed that the process of conferring consciousness (designated by CΨ) on a given Mis as follows. A constant maximal level of CΨ interacts with a given M; the result of this interaction, the level of the outcome CΨ of that M [CΨ(M)], depends on the degree of information processing that M has undergone.

Considering the analogy between the concept of CΨ and the concept of the electromagnetic field (see chapter 6), where the interaction between its variables is multiplicative, I assumed also the following. The relationship between M and CΨ should be based on a multiplicative function. A multiplication of Mi by a constant maximal CΨ that yields an outcome CΨ of M: CΨ(M) = CΨ·Mi. (Note that when the units of measurement of CΨ are known, a certain constant, K, can be used in such a way that K·[ CΨ·Mi] will result in measurement units equal to those of CΨ, e.g., Rakover, 2002.) Here two important comments about the function of CΨ should be made.

First, the analogy of an electromagnetic field suggests that M is covered by a constant maximal induced-CΨ. It is worth noting that this assumption favors the possibility that a constant maximal level of CΨ interacts with (multiplies) Mi over the possibility that the level of CΨ changes as a function of various possible variables. The main reason for this preference is that for the purposes of the ICT the former simpler possibility is satisfactory.

Second, why did I prefer a function based on the product of M by CΨ and not by their addition? Among the other reasons I can think of, the following seems to me the most convincing. If we assume a completely hypothetically situation that no M fulfills condition (c) *enabling-consciousness condition*, then according to the additive function we will get that M=0, which means that the brain is flooded with CΨ, a floating CΨ in the head, whereas according to the multiplicative function we will get that no M is conscious. It seems to me that the second (multiplicative) option is much more reasonable.

Although a large M is induced by a wide field of CΨ and a small M is induced by a narrow field of CΨ, both have the same level of CΨ. The reason for this is that the induced CΨ is maximal and in the present case it does not decrease in its degree, because of the following reason. In order for Mi to represent the stimuli in the world in the most veridical and objective way, the information represented in the M has to undergo maximal beneficial visual-perceptual processing. As a result, the processing level of all Mi is the same (maximal) level and therefore the CΨ(M) of each of these Mi is likewise the same and maximal.

Since the five items (wall, TV, flowerpot, two pictures) are perceived with the same degree of CΨ, the perceiver has the cognitive impression that these items constitute a unified field of CΨ, a whole conscious picture. Another factor that contributes to this impression is the very fact that all these stimuli appear at the same time and in the same location in Smith’s visual field.

The cognitive process of (b) consciousness-generation endows M with consciousness when the (c) enabling-consciousness conditionis met. The process of conferring CΨ on M is automatic, unconscious, and very fast. Any information, whether it pertains to a low-order (LO) M or a high-order (HO) M, will receive CΨ as soon as condition (c) is met. This condition is analogous to the well-known concept of short-term memory (STM, or the working memory). A widely accepted view is that when information enters the short-term memory, it enters a state of CΨ, that is, one becomes conscious of this information (see, for example, Friedenberg and Silverman, 2016; Persuh, LaRock, and Berger, 2018). (Note that in this respect, with the use of the STM construct, the present theory bears some similarities to the dispositional HOT theory proposed by Carruthers, 2000, 2004.)

Given the above, it is possible to delineate certain important relations between subsystems [(b) and (c)] and different Ms in the following way:

1. M is induced with C\* only when the enabling-consciousness conditionis fulfilled(analogously, certain information enters STM).
2. When the enabling-consciousness condition is terminated, the C\* of M is removed and M becomes unconscious; a re-fulfillment of that condition, changes M again to a conscious M.
3. At any given time, the enabling-consciousness condition encompasses a limited number of Ms. Based on experiments in sensory memory (e.g., Sperling, 1960) and research on STM (e.g., Persuh, LaRock, and Berger, 2018; Rakover, 1990; Valler, 2017) one may propose that the amount of information that can be held in that condition is limited. It is possible to hold consciously only one visual field (which consists of a large amount of information) at the time. For example, if Smith sees a cat on a couch, this picture is in his consciousness. However, if Smith turns his head slightly, he sees the flowerpot and peripherally perceives the cat on the couch.
4. Since the enabling-consciousness conditionencompasses a limited number of Ms, an incoming new-M has to replace the previous CΨ(M) (e.g., the incoming new-M has to make room for itself, e.g., an incoming verbal-item pushes out an old one and replaces it, see Rakover, 1990). Thus, the previous CΨ(M) loses its CΨ (it exits this condition and the individual ceases to be aware of it).
5. If the new-M supplements the information of the previous CΨ(M), both the new and the previous Ms are combined. Thus, the individual becomes conscious of both Ms as parts of a whole picture.
6. When two Ms, one from the external world and one from the individual’s inner world, compete to enter the (c) enabling-consciousness condition, CΨ is usually bestowed on the external M because of its survival value. If the external stimulation is blocked, as in the case of experiments in sensory deprivation, this increases the chance of internal Ms fulfilling the enabling-consciousnesscondition, which would have destructive consequences. Indeed, experiments in sensory deprivation in which the sensory stimulation of seeing, hearing, touching, etc. is blocked have shown detrimental effects, such as visual hallucinations, disorientation in time and space, inability to concentrate and think clearly, and restless behavior (see Zubek, 1969). However, if the importance of the internal information exceeds that of the external information, consciousness will be conferred on the former and not on the latter.

These delineated relations between subsystems [(b) and (c)] and Ms can be illustrated with two episodic examples of *switch views* of consciousness. First, Smith sees a house in front of him (he is aware of the house). He turns around and sees a black cat (he is aware of the black cat). He is no longer conscious of the house but only of the black cat. The CΨ(house) is changed into an unconscious-M. In the second example, Smith sees somebody who approaches him and says “What’s up, my dear friend?” After a brief moment he becomes aware that this is his former companion from the army whom he has not seen for many years, and he responds “Hey Dan, it’s good to see you, how are you?” In this case, the unconscious information about Dan’s identity (old buddy) is retrieved from Smith’s long-term memory and activated, so that it becomes conscious.

Although in the *ordinary evening* the degree of CΨ(M) of the five items (wall, TV, flowerpot, two pictures) is uniform, the conscious perception of each and every item is different: it depends on the content of each one and on the level of information processing an item undergoes within the cognitive system. Information processing also explains the following two observations: (a) Smith’s level of processing of the floor and the remote control were low and therefore their CΨ(M) (which is the result of the interaction between CΨ and M) was likewise low; (b) Smith’s attention was completely focused on the film projected on the TV, and as a result the information processing of the other stimuli around the TV dropped to zero level and disappeared from Smith’s C\*.

*A brief Outline of the Observation–Manipulation (OM) Subsystem*

Humans are able to introspect, that is, to conduct internal observation of their conscious feelings and thoughts, which requires being aware of their CΨ. So how does ICT handle this phenomenon? The answer to this question can be illustrated by the following example. David consciously sees a cat [CΨ·M(cat)]. Given the realization of the enabling-consciousness condition, he is aware of being conscious of a cat, i.e., [CΨ·M(cat)] is represented by the OM subsystem, e.g., linguistically, {CΨ·OM [CΨ·M(cat)]}. This means that David is aware of being conscious of seeing the cat: CΨ is conferred on the OM that represents [CΨ·M(cat)]. In other words, David focuses his inner attention on [CΨ·M(cat)]. He becomes aware of consciously seeing the cat by using language that represents this event, e.g., by saying to himself: I am aware that I am consciously seeing this cat.

Similarly, the process of memory can be interpreted in terms of the activation of OM. David remembers that he saw the cat. That is, he is aware that he has seen the cat before. When the event [M(cat)] fulfills the (c) enabling-consciousness condition, it changes from a state of unconsciousness (in the long-term memory) to a state of CΨ and the individual remembers that this event occurred in the past. In a way similar to the process of self-awareness discussed above, the present process requires that the remembered event will be represented by a conscious OM – David remembers (linguistically or pictorially) that he saw that cat. (Here I greatly simplify the process, because the remembered event is associated with additional information related to the time and place of its occurrence, etc.)

The assumption that OM represents the cat’s image in both cases: self-CΨ and memory, leads to the conclusion that the content of the awareness of the awareness and of memory is the cat’s image itself. However, given the hypothesis that OM process is capable of conducting several operations on the content of the perceived image (e.g., Kosslyn, 1975; Shepard and Metzler, 1971) one may understand that in several cases the represented content can be distorted.

*Evaluations of ICT*

So far ICT has been able to provide explanatory outlines for the two everyday observations, self-CΨ and memory. Regarding the first of these, the *ordinary evening* described above, answers were given to two important questions: How do the conscious perceptions of several items generate the impression of CΨ unity? And how are different degrees of CΨ are associated with the perception of different items in a person’s field of vision? Both answers are based on the degrees of information processing that the visual inputs undergo.

The second observation, based on *switch views* of CΨ, offers an explanation for the fundamental question: How does a shift from the observation of visual field A to the observation of visual field B result in the lack of awareness of A and the awareness of B? The explanation is based on the assumption that the (c) enabling-consciousness conditionis able to handle a limited amount of information (in a way similar to STM).

Here I will add another daily observation that I call the *train ride*, which deals with the common phenomenon of remembering, whereby an individual is conscious of a certain subject at a given moment, then becomes unconscious of it for a period (it is forgotten), and remembers it sometime later. David travels from town A to town B by train. The goal of his trip requires him to get off the train at station B and meet Ms Snow, the secretary of Dr. Arnold, who has offered him a new job (let us call it the Travel Goal). The journey takes about two hours and during that time David reads a detective novel and forgets about the Travel Goal. At station B David puts the book away in his bag, gets off the train, immediately thinks about the Travel Goal, and is pleased to be aware that he has remembered the Travel Goal.

The three subsystems (a) visual–perceptual processing, (b) consciousness-generation, and (c) the enabling-consciousness conditionmust be addressed to offer an explanation up to the moment when David becomes aware that he is once more thinking about the purpose of his journey on arrival at his destination. These assumptions also account for the fact that David was not conscious of the Travel Goal during the train journey, since he was aware of the new information provided by his reading of the novel, and the Travel Goal did not occupy his mind. Subsystem (a) offers an explanation for the retrieval of the relevant information from his long-term memory (LTM) once David gets off the train at station B, which serves as a cue for the adequate recall. Given that David closes the book and the relevant information about the Travel Goal is retrieved from his LTM, the two subsystems (b) and (c) begin to process the retrieved information: the information of the Travel Goal reenters subsystem (c). Finally, after CΨ has been conferred on the Travel Goal, the inner OM subsystem comes into play and David enters a state of awareness of his conscious thinking about the Travel Goal.

As can be seen, ICT manages to explain a number of observations in daily life. I will now examine the extent to which this theory succeeds in answering two questions about CΨ that have proven difficult to tackle in the literature.

Question (1): Does ICT explain how CΨ arises from neurophysiological processes in the brain.

The answer is no. The theory does not provide us with a description of how the brain produces CΨ (e.g., Van Gulick, 1995). Subsystems (b) and (c) only assume that there is some process responsible for the creation of consciousness that is induced on an M under a certain condition. Given this, three points should be emphasized here. First, until now I have not found any theory that positively answers this question–an answer that is accepted by the scientific community. Even so, the literature does offer interesting theories about correlations between neurophysiological processes and certain indices of CΨ (e.g., Brown et al. 2019; Carruthers and Gennaro, 2020; Gennaro, 2012, 2023a, 2023b; Rakover, 2018, 2021; Seth and Bayne, 2022; Van Gulick, 2022; Wu and Morales, 2024). For example, it is interesting to note that Brown et al. (2019) proposed an association between the activation of the prefrontal cortex and HOTs.

Second point, although the purpose of the present article is limited mainly to the explanation of the alternating-states problem, it would be ineffective to ignore the theories that claim to explain CΨ. Why? Because if one of these theories is successful, it is most likely that it will also offer a satisfactory explanation for the alternating-states problem. Therefore, I will mention very briefly the well-known information integration theory (IIT) (see chapter 2), which can be conceived of as an identity theory between a causal structure in the brain and CΨ (e.g., Tononi, 2015; Tononi, Boly, Massimini and Koch, 2016; for a review see Fallon 2019). The theory has received many criticisms. For example, Doerig et al. (2019) proposed the “unfolding argument” against IIT. Since for the same input-output function there exist two different networks (recurrent and feedforward) when one is conceived as unconscious and the other as conscious, it can be shown that either IIT is falsified or resides outside the scientific methodology. Another objection is as follows. According to IIT, CΨ is founded on the neurophysiology of the brain. Given this, one may argue that it is possible to construct a mechanical system that meets all the requirements of IIT–a mechanical device that has CΨ. This possibility contradicts people’s intuition, common sense and certain persuasive arguments against the view that a very complex and sophisticated computer or robot will develop CΨ (e.g., Rakover, 2023a,b; Searle, 1980; for similar criticisms see Reggia, 2013).

Third point, I do not claim that a positive answer to question (1) is impossible. Furthermore, ICT may be interpreted as proposing certain theoretical–cognitive processes [subsystems (b) and (c)] that mediate between the mental level and the neurophysiological level, processes that may direct research to the relevant brain correlates. Thus, this theory is in line with the approach of cognitive psychology, which views information processing as being located somewhere between the mental level and the neurophysiological level (e.g., Rakover, 2007; Von Eckardt, 1993). For example, subsystem (b) consciousness-generation may be viewed as a process that integrate the mental level with the cognitive and the neurophysiological levels.

Question (2): Does the present theory offer an explanation of how an unconscious-M becomes a conscious-M?

The answer is yes. Since the two daily episodes: *switch views* and *train ride*, which I have discussed above, demonstrated well the answer to question (2), I will describe here the solution to this question only schematically. Both sub-processes, (b) consciousness-generation and (c) the enabling-consciousness condition, account for question (2). When an unconscious-M, which results from the processing of a given stimulus, fulfills the requirement of (c), process (b) confers CΨ on it and it becomes a conscious-M.

Here I must make the following comment. It is true that ICT manages to explain relatively easily a number of observations. However, this success is based on the very assumption of (b) consciousness-generation, that is, on the very assumption that the brain somehow manages to create CΨ and endow it on a certain MS or process. This is a very reasonable assumption and most researchers assume it – the brain produces CΨ. The problems they face are to identify the neurophysiological mechanism that creates CΨ and to describe its mode of operation - problems that have not been solved to this day. Given these, it seems that the innovation of ICT is founded on the assumption of (c) the enabling-consciousness condition, and on the basic idea that CΨ is induced on any MS or mental process that fulfil this condition. Without that condition being fulfilled, CΨ cannot be produced, that is, CΨ does not appear in the brain as a free-floating energy, it appears when it is induced on that which fulfills condition (c).

Given the above, a very important question arises: Can any unconscious information become conscious? The answer is no, not all unconscious information can become conscious. For example, it seems that visual information, which goes through different stages of processing, cannot become conscious at each stage of the process. Only the information in the final stage of processing may be conferred with C\*. Moreover, various neurophysiological states and processes (physiological, electrical, and chemical) in the body and in the brain will never become conscious (e.g., Morsella, 2005). Van Gulick (1995) suggests that cognitive states and processes as characterized by Chomsky's model will never become conscious.

*Criticisms of HOT*

Briefly, according to HOT theory, an unconscious-M becomes a conscious-M when it is represented by a higher-order-M. For example, one becomes aware of the mental-state of “seeing a cat” when there is a HOT that represents (one is thinking of) “seeing a cat.” Rosenthal (2005, p. 5) writes: “But when a thought represents something as being present, having that thought does make one conscious of that thing. [W]e are conscious of those states by having thoughts about them. And because these thoughts are about other mental-states, we call them higher-order thoughts (HOTs).” It should be mentioned that in most cases a HOT is conceived of as an unconscious-M. Rosenthal writes, “… when a state is conscious, we’re never conscious of an accompanying HOT as relying on some inferential process” (p. 6).

The HOT view has encountered many objections (e.g., Byrne, 1997; Carruthers and Gennaro, 2020; Gennaro, 2004, 2012, 2023b). Although these criticisms have received certain replies, the polemics continue. In this section, I present several interesting objections to HOT theory and show how ICT can effectively cope with them. Note that my intention here is not to critically survey these objections, but to emphasize how the present theory copes straightforwardly with these criticisms.

*Logical problems*. Rosenthal (2004, p. 17) writes, “It is occasionally held that explaining a state’s being conscious in terms of one’s being conscious of that state is circular, since it explains consciousness in terms of consciousness (e.g., Goldman, 1993, p. 366).” This objection is rebutted by Rosenthal (2004), who proposes that one has to differentiate between what it is to be conscious of something and what it is for a state to be conscious, and by Gennaro (2004), who suggests that a HOT is not itself conscious. However, Rowlands (2001) believes that the circularity argument holds because the concept of a mental-state is itself anchored in the concept of CΨ. Furthermore, several researchers have suggested that the argument of infinite regress can be put forward against HOT (Carruthers and Gennaro, 2020; Gennaro, 2004; Rowlands, 2001). Since an unconscious-M becomes a conscious-M thanks to its relation to a HOT, the question arises: How does a HOT itself become a conscious-MS? This is a question that leads to an infinite regress. A possible counterargument runs as follows: in the event that a HOT becomes conscious, Gennaro (2004, 2012) suggests that the discussion here is about introspection, a situation in which the individual directs their conscious attention to a conscious-M, while the state of conscious attention is accompanied by an unconscious HOT (a third-order M).

*The ICT Approach to the Logical problems.* Before I discuss the ICT approach, it is useful to think about a new problem, the issue of “unconscious multi-connections.” As mentioned above, a possible response to the logical problems cited is to assume that a HOT is unconscious. Unfortunately, however, this assumption raises the problem of unconscious multi-connections. According to HOT theory, when two unconscious-Ms are related [the HO mental-state is related to a LO one] the LO mental-state becomes conscious (e.g., Gennaro, 2004, 2023b). Given this, and the reasonable hypothesis that in LTM there is a huge number of unconscious-Ms, one may wonder how is it that one’s mind is not flooded with conscious-Ms, arising from the many connections among these unconscious-Ms. There are endless external and internal stimuli that could trigger different representations stored in LTM, causing many connections that, as a result, may flood the cognitive system with conscious mental-states. [Of course, the relationship between LO-M and HO-M can be defined in such a way that some of the problems related to this relationship disappear (see Gennaro’s discussion of this, 2023b)]. The unconscious multi-connections problem may be conceived of as being related to the idea of the complexity problem (for a review, see Carruthers and Genarro, 2020). Briefly, there is a huge number of conscious-Ms, with each M requiring a HOT to become a conscious-M, and as a result the degree of the complexity of Ms increases immensely.

For ICT the logical and unconscious multi-connections problems do not pose any difficulty. The present theory is not undermined by these objections because all the subsystems of ICT are inborn, automatic, and unconscious processes. Both the circularity and the infinite regress arguments are stopped by these subsystems, which are processes with which one is equipped from birth. The unconscious multi-connections (the possible relation between any two LTM-Ms) do not threaten ICT, simply because there is only one way that an unconscious-M becomes conscious, and that is when subsystems (b) consciousness-generation and (c) the enabling-consciousness condition are activated.

*HOT is not a Necessary Condition for* CΨ. It is unnecessary, since phenomenal consciousness, a conscious-M, can occur without high-order thought. Today, many animal behavior researchers agree that at least the supremely intelligent animals (e.g., apes, dogs, cats, dolphins, etc.) have phenomenal consciousness, they are conscious of the information detected by their senses (e.g., sight, hearing, touch) and their emotions (e.g., pain, fear, pleasure by patting) [see Allen and Trestman, 2016; Rakover, 2007; Seager, 2004]. The problem is that HOTs have to confer consciousness on these Ms, but there are major doubts as to whether animals (and also human infants) possess such advanced higher-order Ms. How one can explain consciousness in animals without recourse to HOTs has sparked dispute. The standard response to this problem is that there is an appropriate HOT, but it is not endowed with the complex and sophisticated qualities that are attributed to this kind of high-order M (e.g., Gennaro, 2023b; Rosental, 2005).

*The ICT approach to HOT is not a Necessary Condition.* Since it is assumed that ICT’s subsystems are innate and developed in accordance with the evolutionary theory, one may suggest that (b) consciousness-generation and (c) the enabling-consciousness conditionalso exist in the cognitive systems of animals (and infants) although at a lower level than that of a mature human. Thus, animals may have consciousness (e.g., Rakover, 2007). However, it is doubtful that animals possess self-consciousness or the ability to be aware of their awareness. For example, the debate continues over whether Gallup’s Mirror Test can provide unequivocal results that indicate self-recognition in animals: Can a chimpanzee really recognize itself in the mirror (see Allen and Trestman, 2016; Gallup, 1998; Povinelli, 1998)? According to the present theory, another system for representing the awareness of consciousness, such as language, is required. While empirical observations indicate that emotions and sensory information are conscious in animals, it is difficult to find experimental evidence to support the hypothesis that animals can be aware of their awareness.

*HOT is not a Sufficient Condition for* CΨ. It is not sufficient, since (1) LO-M receives consciousness from a HOT even though the higher-state M does not correspond to the lower state, i.e., the HOT misrepresents or misinterprets the LO-M, and (2) a HOT occurs without LO-M. According to HOT theory, the HO-M relates to the LO-M and the LO-M thus acquires CΨ. This raises the following problems: How can HOT theory deal with the possibility that one thinks that one sees a *red* flower [(HOT(red)] when in fact one sees a *green* flower? Or how can the HOT approach account for a situation where there is [HOT(red)] without a LO-M? Several solutions have been proposed. For example, Rosenthal (2005) holds the view that such situations are possible and do not pose a challenge to HOT theory. Weinberg (2011) proposes a special definition of the concept of CΨ to solve the misrepresentation problem. Gennaro (2023b) posits that such misinterpretations are improbable, and so the debate on the subject seems to continue (e.g., Carruthers and Gennaro, 2020; Gennaro, 2004, 2023b; Rosenthal, 2005).

*The ICT Approach to HOT is not a Sufficient Condition*. According to HOT theory, CΨ depends on the relationship between two mental-states (HO and LO), whereas according to the present theory, this relation is not important. If any information activates (c) the enabling-consciousness condition and (b) consciousness-generation, this entails a transition from a state of unconsciousness to a state of consciousness. The difference between HO and LO mental-states does not lie in the conscious experience itself but in the contents of the Ms, in what is represented by these two different Ms.

Given the above discussion, one may reach the following comparative judgment. The problem of misrepresentation and the other criticisms of HOT theory can be conceived of as fine examples of the simple and straightforward way in which the ICT handles these problems compared to the complex way in which the HOT attempts to solve them.

I suggest that the fundamental factor behind the above comparative judgment is the major factor that is responsible for the transition from a non-conscious M to a conscious M. While the pillar of HOT is a non-conscious state A that represents state B and thereby makes B a conscious state, the pillar of ICT is the two subsystems (b) and (c) that handle the alternating-states problem. As can be seen from the above discussion, ICT manages to handle this problem more simply and efficiently than HOT theory.

*Several comments on the conception of* CΨ *as an energy-field*

I have speculated that CΨ functions like an energy-field (e.g., electromagnetic field) that radiates a minimal level of energy required to operate certain systems in the brain, which control the individual activity. This speculation is supported by the following observations and arguments.

First, when a human being (or an animal) loses CΨ it cannot even stand on its feet. That is, CΨ is a source of particular minimal energy required to operate certain systems that keep one on its feet and allow it to function effectively in the environment. In other words, CΨ may be conceived as an energy-field that provides a certain minimum energy that serves as a continuous trigger that activates various systems necessary for the individual normal functioning.

Second, the level of CΨ changes from a high to a low and vice versa. This change is reflected in different levels of alertness and mental sharpness. The reduction in vividness and CΨ level is one of the reasons for the need of sleep. Sleep restores the energy of many neurophysiological systems and probably (so I speculate) the CΨ system as well. It is a well-known that after a sleep the level of alertness and mental sharpness is high. Furthermore, research on sleep and CΨ in humans revealed a systematic correlation between certain brain activity and levels of CΨ. A similar correlation has been found also in animals (e.g., Hobson, 2005; Joiner, 2016; Nir, Massimini, Boly & Tononi, 2013).

Third, since CΨ is conceived of analogously to an energy-field, which has a minimal level of energy needed to activate certain systems in the brain, the following question may be answered easily: how is it possible that a non-physical process affects a physical process. The answer is this: CΨ is not conceived of as a non-physical process and it does not violate the principle of “causal closure”, which proposes that for every physical effect there must be a physical cause (e.g., Kim, 2011). However, given this answer, the following problem may arise: according to physicalism, which proposes that CΨ is identical to a certain brain neurophysiological activity, or to functionalism that suggests that a certain brain activity realizes CΨ, the following argument may be conceived of as possibly correct. If (1) human brain processes create, realize, or are CΨ, and (2) a robot’s brain-processes is functionally identical to the human brain-processes, then one may suggest that the robot brain will create CΨ. However, this conclusion can be countered in the following way.

One may argue that assumption (2) is impossible, i.e., the robot’s brain will not create CΨ, because its brain is made of artificial components, which have properties that differ from human brain. (For other similar arguments see Chalmers, 1966; Davis, 2008; Farrell, 1950; Kim, 2011; Searle, 1980; however, see Harnad, 2003). This is the approach I have developed in previous chapters (e.g., chapters 2 and 3), which I call the ‘live-creature correlation’ observation, according to which only live creatures with at least minimal brain and nerve system may have CΨ.

Finally, according to the TOEC, a major factor that prevents the development of a theory of CΨ (TC) is the fact that yet CΨ is not measurable (see chapter 3). We do not know how to measure the conscious experience related, for example, to the perception of the color red. We can describe a red tomato or the red color itself as strong, weak, light, dark, etc., but we have no way to measure this subjective experience, CΨ, in the same way that we measure a distance or a movement made by an individual with his/her hand. It appears that the scientific methodology, which was developed in the sciences, is not able to handle CΨ since this methodology is designed to discover certain relationships between measurable events. Therefore, this methodology has difficulty in developing TC when out of the two necessary variables for developing a scientific theory only one of the variables (the independent one, the neurophysiological processes in the brain) is measurable, while the other variable (the dependent variable, CΨ) is still immeasurable.

**Notes**

1. It is important to note that only recently while reading the chapter by Davis (2008), I realized that Farrell (1950) described an observation similar to the one I describe in the present chapter (and in a previous one, Rakover, 2011/2012). I suggested that the behavior that is explained in psychology is stripped of CΨ and Davis (2008, p. 11) quoted Farrell, who wrote about the behavior studied by psychologists: “*leave something out,* namely, the experiences, sensations, and feelings that the subject is having” (Farrell 1950, p. 171). Despite the similarity in the observation, its use was different. While Farrell used this observation to support his behaviorist’s approach to CΨ, I use this observation to show why a mechanistic explanation of behavior is successful – because behavior to be explained is not intertwined with CΨ.

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